IMAGE PROCESSING APPARATUS USING OPERATION MENU

BACKGROUND OF THE INVENTION

Field of the Invention

5   The present invention relates to an image processing apparatus and, more particularly, to an apparatus which displays a multilevel hierarchical operation menu, and which controls processing relating to an image signal according to a selected item in the operation menu.

10   Related Background Art

Television receivers, video monitors, etc., are known as apparatuses capable of processing image signals and displaying them. As means for enabling a user to adjust and change image and sound qualities in

15   such an apparatus, e.g., a television receiver, a method of using a pull-down menu and a method of using a pop-up menu are conceivable.

Fig. 14 shows an example of a menu display on the screen.

20   There are adjustment/change subjects: "CHANNEL", "INPUT SOURCE", "FUNCTION", "IMAGE QUALITY", and "SOUND QUALITY". With respect to each adjustment/change subject, at least one parameter is set at a lower hierarchical level. In the example shown in Fig. 14,

25   if "IMAGE QUALITY" is selected at the first hierarchical level, one of "BRIGHTNESS", "CONTRAST", "COLOR DEPTH", and "BLACK LEVEL" can be selected at the

second hierarchical level, the direction of adjustment (plus or minus direction) can be selected at the third hierarchical level, and the amount of adjustment can be selected at the fourth hierarchical level.

5   For selection of items at each hierarchical level, downward and upward selection keys, channel-up and channel-down keys or the like of an operation remote controller, etc. are used. For a move from one hierarchical level to another, a specially-prepared key
10   or a key operation is used. For example, when "CONTRAST" is selected at the second hierarchical level, a determination key is operated to display a menu at the lower hierarchical level subordinate to that of "CONTRAST". When one of items in the displayed
15   menu is selected, the determination key is operated to display a menu at a further lower hierarchical level.

Such an operation is repeated to select, for example, "CONTRAST", "MINUS" and "10 EXEC" and the determination operation is then performed to change the
20   contrast value to a value obtained by subtracting 10 from the present set value.

In recent years, however, the above-mentioned kinds of apparatuses have been generally designed as multifunctional apparatuses such that the number of
25   hierarchical levels and the number of alternatives at each level are increased. Under these circumstances, the conventional menu display methods require a process

in which a user must perform many key operations to obtain a certain operation result.

A method of assigning a function probable to be used frequently by a user to one or a small number of keys achieves a certain effect of reducing such an inconvenience. However, functions frequently used by different users vary and this method assigns a number of functions to a number of operating keys to satisfy various user's demands. As a result, this method requires an increased number of operating keys, increases the manufacturing cost of the apparatus and makes it difficult for a user to search for an operating key corresponding to an operation which the user wishes to perform.

A method for enabling a user to freely assign any desired operations to a particular operating key is also effective in simplifying a necessary operating process. Assignment of desired operations to a particular operating key, however, necessitates a complicated key operating process for selecting desired items at desired hierarchical levels from a number of hierarchical menu levels and a number of menu items. The same can also be said with respect to the process of changing operations assigned to a particular operating key.

SUMMARY OF THE INVENTION

In view of the above-described problems of the conventional art, an object of the present invention is to provide an image processing apparatus capable of assigning a desired function to a particular operating key by a simpler operating process.

Another object of the present invention is to attain assigning the desired functions to the particular operating key by a simpler operation.

To attain these objects, according to an aspect of the present invention, there is presented an image processing apparatus comprising image input means for inputting an image signal relating to a television broadcast; menu generation means for generating a menu image signal representing an operation menu relating to processing of the image signal and having a plurality of menu portions at different hierarchical levels each including at least one menu item; display control means for displaying on a display unit an image relating to the image signal output from the image input means and the operation menu relating to the menu image signal generated by the menu generation means; instruction input means for receiving an instruction from an operating unit including a plurality of function keys and selection means for selecting a desired item in the operation menu displayed on the display; assignment means for assigning, according to a predetermined

operation by the operating unit, a function according
to one item selected by the selection means from the
items in the operation menu displayed on the display
unit to one of the plurality of function keys; and

5   control means for controlling, in response to the
operation of the function key, the image input means to
execute processing corresponding to the function
assigned to the function key by the assignment means.

These and other objects and features of the

10   present invention will become apparent from the
following detailed description of a preferred
embodiment of the invention in conjunction with the
accompanying drawings.

15   BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram schematically showing a
configuration of a television receiver to which the
present invention is applied;

Fig. 2 is a diagram showing an example of an

20   operation menu portion at a first hierarchical level;

Fig. 3 is a diagram showing an example of a menu
portion at a second hierarchical level;

Fig. 4 is a diagram showing an example of a menu
portion at a third hierarchical level;

25   Fig. 5 is a diagram showing an example of a menu
portion at a fourth hierarchical level;

Fig. 6 is a diagram showing an example of a

registration menu;

Fig. 7 is a plan view of a remote controller shown in Fig. 1;

Fig. 8 is a diagram showing an example of a display on a screen when a fourth item at the first hierarchical level is selected;

Fig. 9 is a diagram showing an example of a display on the screen when selection through the first to fourth hierarchical levels is completed;

Fig. 10 is a diagram showing an example of a display on the screen including a registration menu;

Fig. 11 is a diagram showing an example of a display on the screen when a third item in the registration menu is selected;

Fig. 12 is a diagram showing an example of a display on the screen including a transparent registration menu;

Fig. 13 is a diagram showing another example of a display on the screen including a registration menu; and

Fig. 14 is a diagram showing an example of a display on the screen including an operation menu.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

An embodiment of the present invention will be described in detail with reference to the accompanying drawings.

Fig. 1 is a block diagram schematically showing the configuration of a television receiver 100 to which the present invention is applied.

Referring to Fig. 1, a BS (broadcasting by satellite) antenna 101, a CS (communication satellite) antenna 103, a ground wave antenna 105 and an Internet 107 are provided.

A BS reception circuit 109 is constituted by a tuner which detects digital data by demodulating an output from the BS antenna 101 and performs error correcting processing, and which thereby generates an MPEG (Moving Picture Experts Group)-2 transport stream (TS) data, a demultiplexer which extracts image data and audio data in a selected channel from image and audio data in a plurality of channels time-division multiplexed in TS data, a video decoder for decoding separated image data, and an audio decoder for decoding separated audio data.

A CS reception circuit 111 has basically the same configuration as the BS reception circuit.

Each of ground wave reception circuits 113 and 115 includes a well-known tuner which receives and processes an input ground wave broadcast signal, such as an NTSC signal or a PAL signal, supplied from the ground wave antenna 105. Each ground wave reception circuit also includes an analog to digital (A/D) converter for converting a received broadcast signal to

a digital signal and a phase locked loop (PLL) for generating a sampling timing signal used by the A/D converter. The ground wave reception circuits 113 and 115 can respectively receive independent channels.

5   A network processing circuit 117 processes input image and audio information supplied from the data network 107, which is a telephone circuit, a local area network (LAN), the Internet, or the like.

An audio processing circuit 119 selects one of 10 audio signals output from the BS reception circuit 109, the CS reception circuit 111, the ground wave reception circuits 113 and 115 and the network processing circuit 117 according to a control signal from a system control circuit 131. The audio processing circuit 119 supplies 15 the selected audio signal to an audio output unit 121 and changes the volume and sound quality of the selected audio signal. The audio output unit 121 is constituted by a digital to analog (D/A) converter for converting the audio signal from the audio processing 20 circuit 119 into an analog signal, and a speaker for outputting the analog audio signal.

An image processing circuit 123 selects at least one of image signals output from the BS reception circuit 109, the CS reception circuit 111, the ground 25 wave reception circuits 113 and 115 and the network processing circuit 117 according to a control signal from the system control circuit 131. The image

processing circuit 123 processes the selected image

signal to effect enlargement or reduction to a

designated size, to change the frame rate and to obtain

an image quality adjustment effect as described below,

5   and writes the processed signal to an image memory 125.

A reference numeral 139 denotes infrared remote

controller. A photo-reception unit 133 receives an

infrared remote control signal output from the infrared

remote controller 139. The system control circuit 131

10   controls the audio processing circuit 119 and the image

processing circuit 123 according to an output from the

photo-reception unit 133, i.e., a remote controller 139

operation performed by a user. The system control

circuit 131 also controls a menu generation circuit 135

15   to display on a screen an operation menu described

below.

A menu image storing unit 137 stores images

representing portions of a menu at different

hierarchical levels, such as shown in Figs. 2 through

20   6. Fig. 2 shows an image representing a menu portion

at a first hierarchical level. A section 301 in Fig. 3

shows an image representing a menu portion at a second

hierarchical level with respect to the fourth item

(image quality) at the first hierarchical level, and a

25   section 303 shows an image representing a menu portion

at the second hierarchical level with respect to the

fifth item (sound quality) at the first hierarchical

level. Fig. 4 shows an example of an image
representing a menu portion at a third hierarchical
level for inputting an instruction for an up- or down-
operation with respect to each item in the menu image

5   shown in Fig. 3. Fig. 5 shows an example of an image
representing a menu portion at a fourth hierarchical
level for designation of the amount of change in each
item at the third hierarchical level. In this
embodiment, the fourth hierarchical level is the lowest

10   hierarchical level. Fig. 6 shows an image representing
a registration menu for designation of a function
registration with each of function keys of the remote
controller 139 described below.

The menu generation circuit 135 forms menu image

15   data according to an instruction from the system
control circuit 131 by referring to the menu image
storing section 137, and outputs the menu image data to
a display control circuit 127. The display control
circuit 127 reads out the image signal stored in the

20   image memory 125, superimposes, on this image signal,
menu image data from the menu generation circuit 135,
and outputs the image signal thereby formed to a
display unit 129. The display unit 129 displays the
image based on the image signal from the display

25   control circuit 127.

Fig. 7 illustrates the remote controller 139.

Referring to Fig. 7, the remote controller 139 has

a menu key 701 for inputting an instruction for display

of a menu, an upward movement key 703 for inputting an

instruction for an upward movement of a cursor, a

downward movement key 705 for inputting an instruction

5   for a downward movement of the cursor, a determination

key 707 for inputting an instruction for determination

and execution of a selection from menu items, function

keys 709, 711, 713, and 715 with each of which a

desired function can be registered, and an end key 717

10   for inputting an instruction for dismissing a menu.

The remote controller 139 also has a power key 719 for

inputting an instruction for turning on or off the

power for the television receiver 100, an input change

key 721 for changing images obtained by the BS

15   reception circuit 109, the CS reception circuit 111,

the ground wave reception circuits 113 and 115 and the

network processing circuit 117 to be displayed by the

display unit 129, keys 723 and 725 for changing the

sound volume, and a channel key 727 for designating a

20   channel.

The operation of this embodiment will now be

described.

The system control circuit 131 controls the audio

processing circuit 119 and the image processing circuit

25   123 according to an input change key 721 operation in

the remote controller 139 performed by a user. The

audio processing circuit 119 selects one of audio

signals output from the BS reception circuit 109, the CS reception circuit 111, the ground wave reception circuits 113 and 115 and the network processing circuit 117 according to an instruction from the system control

5   circuit 131, and outputs the selected audio signal to the audio output unit 121.

Also, the image processing circuit 131 selects one of image signals output from the BS reception circuit 109, the CS reception circuit 111, the ground wave

10   reception circuits 113 and 115 and the network processing circuit 117 and combines the image signal with image data according to an instruction from the system control circuit 131, and stores the image signal in the image memory 125.

15   The display control circuit 127 reads out the image signal thus written to the memory 125, converts the signal into a form suitable for display in the display unit 127, and outputs the converted signal to the display unit 127.

20   In this state, when the user presses the menu key 701 of the remote controller 139 to display an operation menu, the system control circuit 131 instructs the menu generation circuit 135 to generate a corresponding menu image. Receiving the menu image

25   generation instruction from the system control circuit 131, the menu generation circuit 135 reads out a menu image at the first hierarchical level, i.e., the menu

image 201 shown in Fig. 2, and supplies the menu image
to the display control circuit 127. At this time, the
menu generation circuit 135 outputs menu image data
such that a cursor is added to one of the menu items

5   when the menu item is selected, thereby enabling the
selected menu item to be easily recognized.

Next, when the user operates the upward movement
key 703 or the downward movement key 705 of the remote
controller 139, the system control circuit 131 informs

10   the menu generation circuit 135 of this operation.
Then the menu generation circuit 135 moves the cursor
to an upper or lower item at the same hierarchical
level in accordance with the key operation of the
upward movement key 703 or the downward movement key

15   705. Fig. 8 illustrates a state of the display screen
of the display unit 129 corresponding to the result of
the operation described above. In Fig. 8, the item
presently selected ("IMAGE QUALITY" in the example
shown in Fig. 8) is indicated by hatching.

20   And, when the user presses the determination key
707 of the remote controller 139, the system control
circuit 131 informs the menu generation circuit 135 of
this operation. The menu generation circuit 135 reads
out a menu image at the second hierarchical level

25   corresponding to the presently selected item from the
menu image storing unit 137, combines it with the menu
image at the first hierarchical level, and outputs the

combined image to the display control circuit 127. For example, in the case where "IMAGE QUALITY" is selected at the first hierarchical level as shown in Fig. 8, the menu image 301 shown in Fig. 3 is read out from the

5   menu image storing unit 137.

Also at this time, the menu generation circuit 135 adds the cursor to the menu image and outputs the menu image with the cursor to the display control circuit 127, as it does at the first hierarchical level. The

10   user can move the cursor to the desired item at the second hierarchical level by the upward movement key 703 or the downward movement key 705 of the remote controller 139.

The user operates the determination key 707 of the

15   remote controller 139 while, for example, the second item (contrast) in the menu portion 301 at the second hierarchical level shown in Fig. 3 is selected. The system control circuit 131 informs the menu generation circuit 135 of this operation. The menu generation

20   circuit 135 reads out a menu image at the third hierarchical level corresponding to the selected item at the second hierarchical level (e.g., the menu image 401 shown in Fig. 4) from the menu image storing unit 137, combines it with the first- and second-

25   hierarchical-level menu images, and outputs the combined image to the display control circuit 127, as it does in the above-described steps.

Further, the user operates the determination key
707 of the remote controller 139 while, for example,
the second item (minus) in the menu image 401 at the
third hierarchical level shown in Fig. 4 is selected.
5   The system control circuit 131 informs the menu
generation circuit 135 of this operation. The menu
generation circuit 135 reads out a menu image at the
fourth hierarchical level corresponding to the
presently selected second item (e.g., the menu image
10   501 shown in Fig. 5) from the menu image storing unit
137, combines it with the first-, second- and third-
hierarchical-level menu images, and outputs the
combined image to the display control circuit 127, as
it does in the above-described steps. At this time,
15   the menu generation circuit 135 provides display data
such that the cursor is added to the selected item at
each of the first to third hierarchical levels.

Fig. 9 illustrates a displayed state of first- to
fourth-hierarchical-level menu images on the display
20   unit 129 in the case where the user operates the remote
controller 139 by the above-described procedure to
select "IMAGE QUALITY" at the first hierarchical level,
"CONTRAST" at the second hierarchical level and "MINUS"
at the third hierarchical level.

25   When, in the state shown in Fig. 9, the user moves
the cursor to a position on the menu item "10 EXEC" at
the fourth hierarchical level by operating the upward

movement key 703 or the downward movement key 705 of

the remote controller 139 and operates the

determination key 707 of the remote controller 139, the

system control circuit 131 controls each block

5   according to the menu items successively selected and

determined by the user since the menu portion at the

fourth hierarchical level is the lowest-level menu

portion. More specifically, the system control circuit

131 controls the image processing circuit 123 so that

10   the contrast value is changed to a value obtained by

subtracting 10 in terms of an internal parameter value

from the present set value.

Thus, the user can perform adjustment/change

control of the television receiver of this embodiment.

15   Further, in this embodiment, when one of the items

at the fourth hierarchical level, i.e., the lowest

hierarchical level displayed is selected and when the

determination key 707 is operated, the system control

circuit 131 instructs the menu generation circuit 135

20   to enable display of the registration menu 601 shown in

Fig. 6.

According to this instruction, the menu generation

circuit 135 reads out the image data of the

registration menu 601 shown in Fig. 6 from the menu

25   image storing unit 137, combines the read image data

with the data of the operation menu image that has been

displayed as shown in Fig. 9, and outputs the combined

data to the display control circuit 127, thereby displaying the registration menu on the display unit 129 in addition to the menu image shown in Fig. 9, as shown in Fig. 10.

5   In the display shown in Fig. 10, the user can move the cursor upward or downward by operating the upward movement key 703 or the downward movement key 705 of the remote controller 139 to select one of the items from registration in F1 to registration in F4.

10   For example, as shown in Fig. 11, the user operates the determination key 707 of the remote controller 139 while the third item "REGISTER in F3" is selected. The control items selected by the user in the preceding steps are "SOUND QUALITY" at the first

15 hierarchical level, "SOUND VOLUME" at the second hierarchical level, "PLUS" at the third hierarchical level, and "1 EXEC" at the fourth hierarchical level. Accordingly, the system control circuit 131 stores in an internal memory the function of "changing the set

20 value of the sound volume in sound quality to a value + 1 larger than the present set value" by relating it to the F3 key 713. More specifically, the system control circuit 131 stores in the internal memory the key code of the F3 key 713 and processing for "changing the set

25 value of the sound volume in sound quality to a value + 1 larger than the present set value" in a linked relationship.

Thereafter, when the user operates the F3 key 713
of the remote controller 139 in the normal state with
no operation menu displayed on the display unit 129,
the photo-reception unit 133 outputs the key code of

5   the F3 key 713 to the system control circuit 131. The
system control circuit 131 supplied with the key code
of the F3 key 713 controls each circuit of the
television receiver 100 according to the function
stored in the internal memory by being related to the

10   F3 key 713. In this example, the system control
circuit 131 controls the audio processing circuit 119
so that the sound volume is changed to a value + 1
larger than the present set value in terms of an
internal processing parameter.

15   In this embodiment, as described above, the user
can assign the desired operating function to a function
key by only performing a simple operation for selecting
an item corresponding to the function key to which the
user wishes to assign the function from the

20   registration menu displayed as a menu at the lowest
level, i.e., the level subordinate to the fourth
hierarchical level in the process of setting a function
in the television receiver 100 through the ordinary
hierarchical menu. The user may perform a single

25   operation using the function key with which the control
function has been registered to adjust, change and
control the television receiver of this embodiment in

accordance with the contents of the function previously
registered by a simple operation.

An example of a method for storing control items
in a linked relationship with the function key 709,

5   711, 713, or 715 will next be described.

In this method, items at each hierarchical level
are numbered in order and each of the numbers at each
hierarchical level is expressed by a 4-bit digital
signal, for example. In an example shown in Fig. 10,

10   the fourth item (ID = 4) at the first hierarchical
level, the second item (ID = 2) at the second
hierarchical level, the second item (ID = 2) at the
third hierarchical level, and the second item (ID = 2)
at the fourth hierarchical level are selected and the

15   system control circuit 131 stores code data "4222"
representing the processing function at an internal
memory (e.g., an EEPROM) address corresponding to a
designated function key.

The system control circuit 131 stores the number

20   of the items at each hierarchical level and the
corresponding processing functions. When the key code
corresponding to one of the function keys is output
from the photo-reception unit 133, the system control
circuit 131 reads out from the internal memory the data

25   stored by being linked to the function key. If the
contents of the registration of the function key in the
internal memory are "4222", the system control circuit

131 controls the image processing circuit 123 so that the contrast value is changed to a value determined by subtracting 10 from the present set value.

Needless to say, in a case where, while the menu image shown in Fig. 11 is being displayed on the display unit 129, the first item (registration in F1) in the registration menu is selected followed by pressing of the determination key 707, the same function is registered with the F1 function key 709. The registration may be performed in the same manner with respect to the F2 key 711 or the F4 key 715.

When the end key 717 of the remote controller 139 is operated, the system control circuit 131 controls the menu generation circuit 135 so that the menu image is erased and image display in the ordinary mode is performed.

The following three methods are conceivable as a method of selecting a time at which the registration with the function key 709, 711, 713, or 715 is made effective. In the first method, when the end key 717 is operated, the registration operation performed on the menu display before this end key 717 operation becomes effective. In the second method, the registration performed by selecting one of the registration menu items at the lowest layer on the menu display and by operating the determination key 707 becomes effective immediately after the operation of

the determination key 707. In the third method, the registration becomes effective after a lapse of a certain time period if no operation is performed after the registration operation.

5   The registration menu may be displayed in a transparent state such that an image behind the menu image can be seen, as shown in Fig. 12. The registration menu can be displayed in this manner to reduce interference with user's viewing.

10   The arrangement may also be such that if, while the menu image shown in Fig. 9 is displayed on the display unit 129, the user selects one of the menu items at the fourth hierarchical level and presses the determination key 707 of the remote controller 139 for 15   a time period equal to or longer than a predetermined time period, the registration menu may be displayed to enable the user to perform the above-described registration operation. If the user presses the determination key 707 for a time period shorter than 20   the predetermined time period, the menu display process may be terminated without displaying any registration menu.

This method further reduces the amount of user operation and prevents interference of the registration 25   menu with user's viewing.

It is not always necessary to display the registration menu as a menu at the lowest level. For

example, the arrangement may be such that if, while the menu image shown in Fig. 9 is displayed on the display unit 129, the user selects one of the menu items at the fourth hierarchical level and presses the determination

5   key 707 for a time period equal to or longer than a predetermined time period, the system control circuit 131 may control the menu generation circuit 135 to display the registration menu on an end portion of the screen separately from the operation menu from the

10   first- to fourth-hierarchical levels, as shown in Fig. 13.

Needless to say, menu images stored as image data in the menu image storing unit 137 may alternatively be character code data. In such a case, there is a need

15   for font data. However, if the television receiver has a browser function, it has font data for the browser function, and this font data may be shared between the browser function and display of menu images.

Many widely different embodiments of the present

20   invention may be constructed without departing from the spirit and scope of the present invention. It should be understood that the present invention is not limited to the specific embodiments described in the specification, except as defined in the appended

25   claims.